

SCIENCE.

FRIDAY, APRIL 8, 1887.

COMMENT AND CRITICISM.

THE DISCUSSIONS as to cocaine and its effects proceed with vigor, and, while no consensus of opinion seems to have been arrived at by medical authorities, yet the number of cases of the use of the drug that have been observed and studied is rapidly increasing, and will afford the ultimate investigator a large amount of material to go over. The Brooklyn physicians have lately taken a public stand in the matter, based on a paper by Dr. J. B. Mattison, which emphatically opposes the views expressed by Dr. Hammond and others, which have been heretofore commented on in these columns. The action of the Brooklyn physicians takes the form of the draught of a bill to be presented to the legislature, which places cocaine on the list of poisonous drugs to be sold only on a physician's prescription. In his paper, Dr. Mattison says that "no advent in the therapeutic arena during the last decade has been attended with such varied and extensive claims for favor as cocaine. Its marvellous effect in ophthalmic surgery roused a spirit of experimental research in other directions which has added largely to its well-proven power for good; but a potency for good implies a potency for harm, and the risk impends of its ardent advocates being carried by over-enthusiasm beyond the limit of a safe regard for the welfare of their patients or themselves that may imperil an otherwise well-founded success." He believes that the time has come when the evidence justifies a strong statement of the harmful effects of the drug; and, in combating Dr. Hammond's views, Dr. Mattison adduced fifty-one cases of the use of cocaine which attested a power in the drug, on some patients, that warrants caution with all.

Of the cases brought forward by the speaker, one was that of a young woman, twenty-three years of age, who died from an application of cocaine made during an operation for the removal of a tumor in the intestines. Another was the case of a man, aged thirty-three, to whose larynx a four-per-cent solution of cocaine was applied, and

who died from cocaine-poisoning after the second application. A third was the case of a woman in middle life, whose death resulted from the use of a four-per-cent solution for tooth-ache. Numerous cases were given of the poisoning resulting from the use of cocaine as an anaesthetic in surgical operations. Among the effects noted were depression of the brain, profuse sweating, impending syncope, difficult respiration, twitchings of the muscles, mania, paralysis of the heart, nausea, rigors, and so forth. Dr. Mattison further insisted that Dr. Hammond's assertion that there is no danger of cocaine addiction because he himself took half a dozen doses at intervals of from one to four days without 'acquiring a habit,' is valueless as evidence, because "cocainism is not the outcome of using the drug at long intervals. Its transient effect and the demand of an impaired nerve status compel frequent taking, — more than alcohol or opium, — so that habitués have been known to take it ten, twenty, or more times daily; and it is this — growing by what it feeds on — that tends to create and continue the disease." Dr. Mattison's own professional experience has proven for him two things, — first, that cocaine *quid* cocaine possesses a pernicious power; and, second, it finds in the opium-taker a peculiar condition that specially favors its ill effects, making it for such patients peculiarly dangerous. In concluding his paper, the writer summarized thus: "Cocaine may be toxic, sometimes deadly, in large doses. It may give rise to dangerous or even fatal symptoms in doses usually deemed safe. The danger, near and remote, is greatest when given under the skin. It may produce a diseased condition, in which the will is prostrate and the patient powerless, — a true toxic neurosis, more marked and less hopeful than that from alcohol or opium.

Dr. Crothers, in the *Medical and surgical reporter*, gives the following statement of his views on cocaine: "Among alcohol inebriates and drug maniacs, cocaine inebriety is no doubt increasing. Its peculiar dangerous effects on the body will prevent its general use as an intoxicant to any great extent. It acts more rapidly than opium, but its effects pass off more quickly. Its first ef-

fect is more exhilarant than that of alcohol, but it is uncertain and variable. This stimulant action develops mania, followed by narcotism and melancholia. As an intoxicant, it is more dangerous than alcohol or opium. As a form of inebriety, it is more difficult to treat, requiring a longer time to break up, because of the physical and psychical complications. It cannot be used as a substitute for any other narcotic, or as an antidote or remedy." Dr. Hammond of New York finds, as the result of personal experience with cocaine, that two grains in a pint of wine produced all the beneficial and none of the deleterious effects of the drug. One grain injected hypodermically has an effect similar to that of two or three glasses of champagne. He thinks that cocaine has a refining and softening effect, while the tendency of alcohol is to lower the mental and moral tone, and to brutalize a man. Three grains produced a great disposition to talk, with vivid imagination. Writing was accomplished with great ease, and wonderful progress was made with a medical work which he was preparing. On the following morning he found the work to be composed of incoherent sentences and disconnected ideas, being utterly nonsensical. He subsequently took eight grains of the drug, which produced painful sensations.

Dr. Frank H. Bosworth of New York has had considerable experience with cocaine. He says that in no single case of hay-fever which he has treated with it has he been able to detect any distressing reaction from its use. In a few cases the remedial effect has not been such as desired, but the proportion of such cases has been small. He has used cocaine in a hundred and fifty cases, and in but two was there any reaction, and in neither was this of a distressing character. Many patients have used the drug daily for eighteen months without any reaction, and without there being any toleration created, the same effect following its use at the end as at the beginning of the period, — complete relief. Being a sufferer from hay-fever, the doctor used the drug himself, applying it, in a solution of four per cent, to the nose. The relief was immediate and great, but lasted only from two to three hours. He used it frequently during the day in this way, at the beginning using from two to three grains daily. After using from half a grain to a grain, he experienced the full constitutional effects of the drug, which were a feeling of

absolute peacefulness and repose, entire immunity from worry or care, thorough wakefulness, or, rather, alertness of intellectual faculties, with something of an indisposition to exertion. Together with this was an enjoyment of his cigar such as he had not experienced since he was a young man. In this way he would sit and smoke and read hours at a time. He soon found that he was taking from five to eight grains of cocaine daily. At night he would fall into a refreshing sleep, and awake in the morning without an unpleasant symptom. After breakfast, his hay-fever symptoms coming on, he would resume his cocaine. This he continued for more than two and one-half months; at one time, in order to test the drug, carrying the quantity as high as twenty-five grains between dinner and bed-time. In all, he used about an ounce of the alkaloid. His conclusions are as follows: 1°. The use of the drug produced no tolerance: two grains produced as marked a constitutional effect as twenty-five. 2°. No cocaine habit was contracted. At no time from the commencement of the experiments to the end of them was there ever the slightest craving for it. 3°. The local effect at the end of three months, in contracting the blood-vessels of the nose, was as quick and as efficient as at the time of the first application. 4°. There was not at any time the slightest local reaction following its use. 5°. In not a single instance was he able to detect any constitutional reaction after its effect passed away.

WE WERE IN ERROR last week in reporting that the sum of \$400,000 had been appropriated by congress for the erection of a new naval observatory near Washington. The amount actually available is but \$100,000, with the understanding that the entire cost of the work shall not exceed \$400,000. Mr. Hunt of New York, the architect appointed by the secretary of the navy, has been in Washington examining the site, and consulting with the superintendent of the observatory and Professor Hall, and it is understood that he is now at work upon the detailed drawings. Plans were prepared some seven years ago under the direction of Admiral John Rodgers, then superintendent of the observatory, but they will be very largely modified in order to isolate more effectively the observing-rooms from the main building. Ensign Winterhalter of the U. S. naval observatory has sailed for Paris to represent the observatory at the

conference called by Admiral Mouchez, director of the Paris observatory, for the purpose of forming a plan of co-operation in photographing the whole sky. The proposition is to enlist ten or twelve observatories in the undertaking, and to obtain instruments of uniform power, so that their work may be homogeneous. If the suggestion that each plate shall be four degrees square is adopted, about 11,000 plates will be required; and, with an average of 100 plates per year from eleven observatories, it will take ten years to complete the map. It is understood that Dr. Peters of Clinton, and Mr. Rutherford of New York, will also attend the conference.

A VERY VALUABLE CONTRIBUTION by T. Mitchell Prudden, M.D., on bacteria in ice, and their relations to disease, with special reference to the ice-supply of New York City, appears in the *Medical record* of March 26. In a series of thirty-two biological analyses of the Croton water, as it is delivered in the city, Dr. Prudden found the lowest number of living bacteria to be 57 to the cubic centimetre; the highest, 1,950; while the average was 243. While it was at one time thought that the presence of a considerable number of living bacteria in a water was evidence of its being unfit for drinking-purposes, we have now learned that this view must be greatly modified. Bacteria are almost everywhere present, in soil, air, etc., and by far the larger proportion are, so far as we know, perfectly harmless. Their rôle in nature is to tear down organized bodies into their simpler constituents, a small part of these being used for their own nutrition and growth, while the larger part is given up to other organisms for their life-purposes. It still remains true, however, that a certain number of species, which can live in water as well as elsewhere, can and do produce deadly diseases, and are responsible for some of the most frightful epidemics.

Dr. Prudden made a series of experiments to test the effect of freezing on the bacteria. His method was as follows: a large number of test-tubes were plugged at the mouth with cotton, and sterilized. Into these tubes was put sterilized water mixed with a small quantity of a pure culture of some well-defined species of bacteria, the number of bacteria in one cubic centimetre of water having been previously determined. The tubes were then exposed to a temperature of from 14° to 30° F.,

the water becoming solid in a short time. Six different species of bacteria were thus experimented with: 1°. *Bacillus prodigiosus*; 2°. A short bacillus frequently found in the Hudson River water, and occasionally in the ice, apparently identical with the *Proteus vulgaris* of Hauser; 3°. A slender bacillus very common in Croton water; 4°. *Staphylococcus pyogenes aureus*, derived from a case of pyaemia; 5°. A short bacillus very common in ice all about New York, which may be designated the 'fluorescent bacillus,' from its appearance in gelatine; 6°. The bacillus of typhoid-fever. In the case of the *Bacillus prodigiosus*, there were 6,300 bacteria in a cubic centimetre of water before freezing; after being frozen 4 days, 2,970; after 37 days, 22; and none after 51 days. Of the *Staphylococcus pyogenes aureus*, there were a countless number before freezing; after 18 days of freezing, 224,598; after 54 days, 34,320; and after 66 days, 49,280: of the typhoid-fever bacillus, innumerable before freezing, 1,019,403 after being frozen 11 days, 336,457 after 27 days, 89,796 after 42 days, and 7,348 after 103 days. These experiments were repeated with practically the same results, so that it may be accepted as abundantly proven, that, after prolonged freezing, a considerable number of the typhoid bacilla remain alive.

WILLIAM BABCOCK HAZEN.

THE sudden death of Brig.-Gen. William B. Hazen, chief signal officer of the U. S. army, which occurred on Sunday, Jan. 16, 1887, deprived the country of one of its most distinguished officers, and the signal corps of a chief who took a broad view of its duties and relations to the world of business and science.

Gen. William B. Hazen was the great-grandson of Thomas Hazen, who was born in 1719, and who was himself a great-grandson of Edward Hazen, who emigrated from England before 1649, and settled at Rowley, Mass., where he died in 1683.

The descendants of Edward Hazen include many names eminent in business, theology, and war. Energy, industry, and strong convictions characterize the members of the family on all sides.

General Hazen was born at West Hartford, Vt., Sept. 27, 1830. While he was yet a child, his parents removed to Hiram, Portage county, O. In 1851 he was appointed from Ohio as a cadet to the U. S. military academy at West Point, from which he graduated July 1, 1855. He was assigned to the 8th U. S. infantry, and spent the next five

years in frontier service, more especially against the Indians in California, Oregon, and Texas, in which service he displayed an energy and bravery that have been characteristic of his life. His record during these years embraces constant fights and pursuits. He was twice severely wounded, and by virtue of his wounds, he was, in January, 1860, by the surgeon's order, granted a leave of absence as being unfit for duty. In consequence of this, he was at the north, while his regiment was in Texas, at the breaking out of the rebellion. The regiment having been captured, and its officers released on parole, he alone was unembarrassed by the parole, and was able to offer his services to the Union army. He was at once assigned as temporary instructor at West Point. In May, 1861, he became captain in the 8th infantry of the regular army, and in October was made colonel of the 41st regiment of Ohio infantry, in the volunteer army. During the war, he distinguished himself on many occasions, and his commission as major-general was granted him Dec. 13, 1864, for 'specific distinguished services;' i.e., "for long and continued services of the highest character, and for special gallantry and service at Fort McAllister." This placed him fifth in a list of twenty-four officers who had received commissions for distinguished services.

He continued serving on the frontier territories, north and west, and was especially active in Indian affairs, until 1870, in which year he was allowed leave of absence to visit the seat of war in Europe. The results of his observations and studies during his six-months' absence are embraced in a volume entitled 'The school and the army in Germany and France, with a diary of siege life at Versailles' (New York, 1872). This volume contains an interesting sketch of Bismarck, and Bismarck's own account of the state of affairs in Europe. It contains especially a fair criticism of the relative excellences of the German and French systems, both civil and military. In a special chapter on that subject, he incidentally brought out more prominently some weak points in our own military organization. It would seem that the courage displayed so brilliantly on the battlefield frequently nerved him to utter not only these but other fearless criticisms of things that were palpably wrong, and some of which have since been corrected.

He was married Feb. 15, 1871, to Millie, daughter of the Hon. Washington McLean of Cincinnati, who, with one son, survives him.

On his return from Europe in 1871, he returned to duty in the Indian Territory, and was with his regiment in Kansas and Dakota, except for a short absence, until Dec. 15, 1880, when he was

by President Hayes appointed brigadier-general and chief signal officer, and has since then been stationed at Washington. The absence just referred to was occasioned by his again visiting Europe as military attaché to the U. S. legation at Vienna, for the purpose of studying the operations of European armies during the Turco-Russian war. He was absent on this service from December, 1876, to June, 1877, and the results of his observations were published subsequently in a highly interesting popular volume.

The general account of his activity during the war of the rebellion was published by him in his 'Narrative of military service' (Boston, 1885).

His letters and pamphlets on the 'Bad Lands' show that for many years General Hazen had been studying the relations of meteorology and agriculture. Upon his appointment as chief signal officer, he became indefatigable in his efforts to improve the military and departmental relations of the signal service, its scientific character, its practical usefulness to farmers and herders, and its popular influence. His labors in Washington stirred up most virulent opponents, — first, when it became necessary for him to expose and prosecute the corruption of Captain Howgate; again, when it became necessary, in self-defence, to expose the true reasons of the failure of the war department to properly support and succor the signal-service expedition to Fort Conger; and again, when he had occasion to defend the advantages of the military character of the combined signal-service and weather-bureau organization against those who would take it from the army without making a proper provision for its work in any other department. The records of his successful defence against attacks prompted by implacable hate, official stubbornness, and personal ignorance, are to be found in the Proceedings of courts-martial, courts of inquiry, committee of congress on expenditure, and especially in the 'Testimony before the joint commission to consider the present organization of the signal service,' etc., which last voluminous report, with testimony, was printed in June, 1886.

General Hazen's interest in meteorology, as before said, properly dates back earlier than 1873, at which time he prepared a letter on 'Our barren lands, or the interior of the United States west of the 100th meridian and east of the Sierra Nevadas.' This was published in the *New York Tribune*, Feb. 27, 1874, and led to a discussion in that paper, and in the *Minneapolis Tribune*, between himself and Gen. A. A. Custer, which is summarized in a pamphlet of the above title published by Robert Clarke & Co. of Cincinnati, in 1875. The motive of General Hazen evidently was the protection of

investors and settlers against the too glowing accounts, which amounted to virtual misrepresentation, on the part of the employees of the Northern Pacific railroad. His compilation of climatological data, and his statement of personal experience based on long residence in that region, largely contributed to prevent blind emigration into an inhospitable country, while they doubtless also contributed to direct attention to the really valuable portions of our north-west territory, so that the permanent development of that portion of the United States has been furthered by his action. It was, however, at the time, on his part a very characteristic, outspoken exposition of what seemed to him a fraud and imposition, perpetrated by unscrupulous financiers upon foreign immigrants and over-confiding settlers and investors.

During his connection with the signal office, General Hazen frequently took occasion to show his appreciation of the fact that the weather-predictions were essentially not a matter of mere military routine, but that in all departments the office had need of the work of specially trained experts; that it was a mistake to shut one's eyes to the fact that in a matter of applied science, like this, some of those whom the scientific world recognizes as meteorologists and physicists must be employed, and be required to keep the chief fully informed of the progress of science. Perhaps this is best exemplified by a quotation from his letter of March 24, 1886, addressed to a committee of the house, on expenditures of the war department: "At the beginning of the work of the signal service, the duty of giving notice of the approach and force of storms and floods, for the benefit of commerce and agriculture throughout the United States, implied that the notices should be correct, reliable, and timely, as none others could possibly be of benefit; it was therefore absolutely necessary to provide for the careful study of the atmosphere. On my accession, I found every evidence from popular criticism that still further progress in weather-predictions was expected. I therefore emphasized especially the necessity of the study of the instruments and methods of observing, and the investigation of the laws of the changes going on in the atmosphere. . . . It is evident by these successive steps, that, in addition to knowledge gained for current work, the office is powerfully contributing towards the establishment of a deductive science of meteorology, which will eventually give us a solid, rational basis for predictions, thereby improving on the empirical rules by which predictions have generally been made hitherto." And he adds that he was led more especially to assist in the researches

on the sun's heat by reason of the encouragement given him by the late President Garfield, whose "last words to me were, 'Give both hands of fellowship and aid to scientific men.'"

As a further illustration of General Hazen's appreciation of the scientific needs of the office, must be noted his appointment of Prof. William Ferrel as meteorologist, and of Prof. T. C. Mendenhall as electrician: to the latter, all matters relating to standards, instruments, and instrumental research were also committed. Nor did he stop here, but, by appointing several younger men to positions as junior professors, he largely increased the amount of study and research that the office was able to perform; and by publishing a series of professional papers and smaller notes, he took the final steps necessary to stimulate every man to do his best.

Laboring in this same direction, he sought to elevate the intelligence and scientific training of the signal corps proper, by enlisting college graduates as far as possible, by extending the course of instruction for observers, and by establishing a course of higher instruction for commissioned officers.

In still another direction General Hazen showed his affiliation with scientific interests; namely, by his desire to conform as thoroughly as possible to the recommendations of the international meteorological conferences. These recommendations, as soon as received in the printed minutes of the conferences, were, by General Hazen's orders, carefully examined, and instructions at once prepared calculated to introduce methods of observation and publication in conformity with the recommendations of the leading meteorologists of the world.

Among the items specially noteworthy, wherein General Hazen developed new paths of activity for this service, may be mentioned the study of local thunder-storms and tornadoes, which were assigned respectively to Prof. H. A. Hazen and Lieut. J. P. Finley so far as a collection of general statistics is concerned, and to Professor Mendenhall so far as concerns the electrical phenomena proper. The study of atmospheric electricity was especially authorized in 1884, by an order of the secretary of war, transmitting the resolutions of the international electrical conference held in Paris the preceding year. After full consultations with numerous electricians throughout the country, General Hazen decided that a daily map of electric potential, showing lines of equipotential, similar to the isobarometric lines, offered hopeful prospect of leading eventually to a method of predicting the formation and motion of thunder-storms and tornadoes. But the methods of observation and the apparatus

needed first to be determined upon, after careful experimental work. This whole matter was therefore, in 1885, committed to the hands of Professor Mendenhall.

Perhaps the most important item in internal administration, so far as it affects the permanent scientific value of the office-work, was the effort, heartily furthered by General Hazen, to improve the accuracy and international comparability of our instrumental equipment. The standards of the International bureau of weights and measures were recognized by him as being the proper legal standards for this office, and every effort was made to determine the corrections needed to reduce the past as well as the current meteorological observations of the signal service to agree therewith.

Perhaps the generous breadth of General Hazen's views, the absence of injurious jealousies, and his confidence in the principle that the weather-bureau would be strengthened by the widest diffusion of an intelligent appreciation of meteorology, are in nothing more clearly shown than in the earnestness with which he stimulated the formation of state weather-services, and encouraged the study of meteorology in every school and college. He was painfully impressed by the disastrous influence upon individuals and business of the wide-spread and utterly absurd predictions of the storms and weather of the 9th of March, 1884, which emanated from Mr. Vennor, and were distributed broadcast through the country. He saw clearly that all this harm could be prevented only by increasing the intelligence of the people in scientific matters, and heartily indorsed every effort to diffuse a more correct idea as to what constituted legitimate meteorology.

Although his duties demanded the maintenance of a great central office at Washington, yet General Hazen realized that centralization could easily be carried too far in scientific matters, and would thus react injuriously upon the work of his office. He was desirous of rapid progress in all directions, and, to secure this, welcomed every prospect of co-operation with other institutions as well as with individuals. One of his first acts was the request for co-operation on the part of the National academy of sciences. He improved the opportunity to help Professor Langley in the determination of the absorbing-power of the atmosphere; he accepted Professor King's offer to carry observers on his balloon voyages; he heartily furthered Lieutenant Greely's efforts to maintain an international polar station, and joined with the coast survey in establishing a similar station, under Lieutenant Ray, at the northern point of Alaska; he co-operated with the bureau of navigation in securing

weather-reports from the ocean; he powerfully assisted the metrological society in its labors for the reformation of our complicated system of local times, the result of which was the adoption by the country of the present simple system of standard meridians one hour apart.

Equally successful was he in his efforts to co-operate in various methods of disseminating and utilizing the knowledge obtained by the weather-bureau for the benefit of the business interests of the country. With the telegraph companies he published the daily telegraph bulletin. Through the railroad companies he displayed the railroad train signals, visible to every farmer along the railroads. With local boards of trade and other business interests he elaborated our system of flood-warnings in the river-valleys.

General Hazen was especially clear in his views as to the importance of giving personal credit to each man for his own personal work. Routine work was credited to the assistants in charge, and not to the impersonal office. Having assigned a special work to the best man available, he took pains to give him the credit, and make him personally responsible for its success, thus securing more enthusiasm in the work.

This notice of a few prominent features in the intense activity of General Hazen's life seems eulogistic rather than historical; but, to the contrary, the fact is, that military life rarely offers a position that requires the promotion of any special science, and still more rarely do official or military circles present an officer who so thoroughly desired, as far as allowable, to relax stringent military law, and liberally interpret cumbersome official regulations, so that scientific men might successfully promote their special work.

CLEVELAND ABBE.

ETHNOLOGICAL NOTES.

THE Proceedings of the U. S. national museum, for 1886, contain a paper by George H. Boehmer on Norsk naval architecture. He compares the modern Northland boat, which is in use along the coast of Norway, round the North Cape to the frontier of Russia, with the ancient Norsk boat. In this boat he recognizes the oldest forms known. These are known from the rock sculptures discovered in Sweden and Norway, which are supposed to have been made from five to eight hundred years before the Christian era; from boat-shaped stone burial-groups, supposed to have been erected during the transition time from the bronze period to the iron age, in Scandinavia; and from boat-remains. The boat is long, narrow, and low, with stem and stern posts alike, both being curved and high. The rowlocks of these boats bear an oblique pro-

longation on one end, and are furnished with a loop through which the oar is passed. They have a single mast amidships, and a single sail. In the rock carvings similar boats are represented all along the coasts of the Baltic, as far east as the south-east bank of Onega Lake, and on the coast of Norway. In the boat-shaped stone groups the high stem and stern posts are indicated by large boulders; the rowlocks, by excavations in the stones. The boat-relics resemble the modern boat even in details, and show how little change has been made in northern naval architecture since olden times.

Donald A. Cameron, English consul for eastern Soudan, is studying the ethnology of the district of Suakin. The preliminary result of his researches is that the Beja (Bisharin), which is the general name applied to all tribes of that country speaking Tobedawiet, are the aborigines, who gradually adopted Islam through contact with the coast or with Egypt after they had absorbed a number of Arabs from Yemen who had invaded their country (*Journ. anthrop. inst.*, Feb. 1887).

The Bulletin of the Italian geographical society, for February, contains the catalogue of an ethnological collection made by General Gené in the Italian possessions on the Red Sea. It consists of implements, clothing, ornaments, and weapons belonging to the Beja, and some Somali and Abyssinian objects. The explanation of the well-known implements is very full, and contains much valuable information.

Ph. Paulitschke has published the results of his studies on the Somali, Galla, and Harrari ('Beiträge zur Ethnographie und Anthropologie der Somäl, Galla, und Harari,' Leipzig, 1886). He gives a full description of the ethnological character of these peoples, and several anthropological measurements. It is impossible to point out the numerous new observations contained in this book, and we confine ourselves to stating the conclusions at which the author arrives regarding the history of these peoples. Originally the country was inhabited by negroes who had been driven from their old seats by Hamitic invaders, who came from the north. Later on, an Arabic invasion took place, which began in the sixth century and lasted until the sixteenth. The invaders and Hamites intermarried, and thus formed the Somali and Dankali, which latter contain a larger proportion of Semites. These nations attacked the Gallas, who were driven from the shore to the country they now occupy. A map which accompanies the book shows the distribution of the tribes.

R. N. Cust has presented to the Anthropological institute of England a collection of symbolic letters such as are used by the Jebu in West

Africa. They are figured in the Journal of the anthropological institute (February, 1887), and full explanations are given. There are many specimens of such messages in the ethnological collections; but few of them have the explanations, which alone make them valuable. It would be very desirable to have examples of symbolic messages collected among all peoples, and their study pursued in connection with that of picture-writing and sign-language.

The Journal of the anthropological institute (February, 1887) contains an interesting paper by A. W. Howitt, on songs and song-makers of some Australian tribes, and several specimens of songs noted down by G. W. Torrance. The poets of the tribes are held in great esteem. Their names are known to the neighboring peoples, and their songs are carried from tribe to tribe, even beyond the limits of the language in which they are composed. The natives believe that the songs are obtained by the bards from the spirits of the deceased, usually their relatives, during sleep, in dreams; but Howitt gives some instances of songs which are descriptive of events, and, as the poets declare, composed under the influence of some natural cause. Torrance gives three tunes, which he has divided into bars, according to the style of our music. This, however, is not correct, as the irregular accent does not allow their being arranged in this way. Fortunately the study of aboriginal poetry and music is being taken up now by several students. We call to mind Brinton's, Stumpff's, and Baker's researches. But an energetic pursuit is very desirable, as the native literature, which is handed down by tradition alone, is being rapidly lost everywhere.

Dr. H. Rink announces the death of Samuel Kleinschmidt, which occurred at Godhaab, Greenland, Feb. 9, 1886. Kleinschmidt, who was born in Greenland, is distinguished by his eminent knowledge of the Eskimo language. The results of his studies, which form the foundation of our knowledge of that language, are contained in his dictionary and grammar of the Eskimo language. Of late he took an active part in studying the meteorology of Greenland.

W. Sievers gives a brief sketch of the Arhuaco Indians, who live in the Sierra Nevada de Santa Marta, in the *Zeitschrift der Gesellschaft für Erdkunde* (vol. xxi. p. 387). The author travelled in Columbia in 1886, and visited the four villages of these Indians. The natives living on the northern declivity of the Sierra have preserved their old customs to a higher degree than the rest. Sievers describes their round, low huts and their scanty household goods, which consist of a pot, a bed, a few wooden stools, and a number of pouches

made of the fibres of the agave. The men and the women live in separate houses, and are never allowed to be in one room. The man takes his meals on a stone, between his house and that of his wife. They eat little meat, but live principally on vegetables, which are grown in small gardens. Though many of them have become Christians, they still adhere to their old religious feasts and dances, which they perform at the celebration of the saints of their villages. Each tribe has its peculiar dances, which are accompanied by two kinds of flutes, marimbas, and rattles. Sievers states that they believe a woman, by the name of Inhimpitu, to have been the mother of the ancestors of their gentes. These ancestors created the earth, the houses, the sun, — which formerly was buried in the ground, — the moon, and the stars. Takina is their principal place of worship. Here rows of stones are found, with interplaced granite boulders. A wizard watches this place, which no Spaniard is allowed to visit. In a small temple, and two huts which stand near by, various utensils used in the worship are kept, — drums, flutes, masks, rattles, and tripods made of wood. Under one of the large boulders is the grave of a wizard, to whom they give offerings. The wizards cause disease by throwing spiders, scorpions, or lizards into the bodies of their enemies, and cure the sick by exorcising the cause of the disease. They are not allowed to eat any salt. During the great festivals, which are celebrated in January, the Indians must abstain from the meat of domesticated animals. At Masinga, on the upper Manzanares, there are large ruins of a temple, and long, remarkably straight roads leading to it. Ancient roads are found in many parts of the Sierra, and are frequently used for the construction of modern roads. A grammar of the language of the Arhuaco, the Kōggaba, has been published by R. Caledōn ('Gramatica de la lengua Kōggaba,' Paris, 1886).

E. T. Hamy believes that the sinuous line which is found on one of the monuments of Copan, in Honduras, is identical with the Chinese Tai-Ki (*Journ. anthrop. inst.*, February, 1887). Though these figures closely resemble one another, both consisting of two semicircles lying in opposite directions and touching each other, this is no proof of a common origin and identical meaning. The Chinese symbol represents two opposite principles, — the active and passive spirits, the masculine and feminine, light and darkness. The conclusion drawn from the similarity of ornaments occurring in widely separated regions, upon the identity of their symbolic meaning or their common origin, is fallacious.

Chaffanjon, who is exploring the upper Orinoco, found at Ature, in a cave of the Cerro de los muertos, the burial-place of the Piaroas. The corpses and those objects which had been most valuable to the deceased are put into a kind of basket, or into a cylinder made of twigs arranged in parallel lines round the body and tied together. Most of them are covered with stones to keep them from being disturbed. In the cave of Arvina, in Cerro Saloajito, Chaffanjon found vases differing in style from those which Dr. Creyauux found at Maipure. On the rocks of Cerro Purtado he found large sculptures. From his observations on these inscriptions he concludes that extraordinary means and a long time were required for making them. These petroglyphs seem to be of frequent occurrence in those districts. Recently A. Jahn found several in the Loma de Maya, west of Caracas. One of them is figured in the *Zeitschrift für Ethnologie* (1886, p. 371). The commission for determining the boundary between Brazil and Venezuela found others on the left bank of the Guainia, between Solano and Buena Vista. Similar rock inscriptions are found below Maroa, near San Gabriel, Itapinima, and at other places, and, according to W. Sievers, on the upper Manzanares. Chaffanjon studied the dialects of the country he traversed, and collected extensive vocabularies of the Baniaba, Piaroa, Guahiro, Puinabe, Piapoco, and some of their grammatical elements. All of these belong to the same stock.

GEOGRAPHICAL NOTES.

Europe.

The government of Roumenia plans a triangulation of that country. As the basis of the present maps is founded on the reconnaissance made by the Austrian army during the occupation of Roumenia in 1855, a thorough survey is very desirable for completing our knowledge of the topography of Europe.

Asia.

The following notes on the work of the Indian survey are taken from *Petermann's Mittheilungen*. Besides the regular reports, the annual report for 1884 and 1885 contains the results of expeditions made in the countries adjoining India. Col. R. G. Woodthorpe visited the western head waters of the Irawadi, — the Nam Kiu. He followed the Dibing, a tributary of the Brahmaputra, to its sources, crossed the Phungan Mountains at the Chaukan Pass, and reached, south of the farthest point reached by Wilcox in 1826, the Nam Lung, which he descended to its confluence with the

Nam Kiu. After a visit to Padao, the capital of the Bor Kamti, he retraced his journey, following the Turong, which is the principal source of the Kyendwen. The map showing the results of this journey is contained in the January number of the Proceedings of the Royal geographical society. The amount of rain falling in the mountains crossed by Woodthorpe explains the enormous quantity of water carried by the Irawadi. Col. H. C. B. Tanner tried to enter Tibet, but was prevented from carrying out his intention by the Tibetan boundary post at Purang Jong. He explored some parts of Bhutan, and had the foot of the Kinchinjinga surveyed. The Indian survey plans the publication of maps showing the countries adjoining India. These 'Trans-frontier of India sheets,' which will be on a scale of an inch to eight miles (1 : 506,880), will consist of four parts : 'North-western trans-frontier,' including Beluchistan, Afghanistan, Turanian states ; 'Northern trans-frontier,' including East Turkestan and western Tibet ; 'North-eastern trans-frontier,' including eastern Tibet as far as Yun-Nan ; and 'South-eastern trans-frontier,' including Burma and western Siam. These maps will embrace the Indian surveys, the results of which have not been made public, on account of political reasons, and a critical review of the whole available material. It is proposed to extend the work to western Persia, Asia Minor, and Arabia.

Africa.

G. A. Krause, whose arrival at Mosi was announced a few weeks since, has proceeded by the way of Duensa to Safaram on the upper Niger. He intends to follow the river to Kabara, the port of Timbuktu. As Krause travels undisguised, as a Christian, he expects to find some difficulties at Massina on account of the fanaticism of the Fulbe.

Upon his return to Berlin, a reception was tendered to Dr. Junker by the geographical and anthropological societies. Junker gave a brief sketch of his six years' travels in Africa. In January, 1881, he went from Suakin to Khartum, whence he ascended the Nile by steamer to Meshera. From there he travelled to Ndorumo, where he established a station in May, 1881. He described his explorations south and west of Ndorumo, in the unknown district drained by the Welle and its tributaries. He made large ethnological collections among the Mang-Battu (Schweinfurth's 'Mombuttu'), which he sent by his companion Bohndorf to the Bahr-el-Ghazal. Unfortunately these were lost. The progress of the Mahdi prevented Junker's return, so he went to Laddo to Emin Bey, expecting to meet a steamer going north. The Emir Karam had sent them notice of

the capture of Lupton Pasha, governor of the province of Bahr-el-Ghazal, and in January, 1885, they learned of the loss of Khartum. Later on, the Mahdi attacked Emin Bey, and took Amadi, which is only five days distant from Laddo. For some unknown reasons, however, he retreated. Dr. Junker then returned to Europe, starting from Wadelai.

America.

The proposed field-work of the Canadian geological survey for the coming season includes an extensive topographical and geological survey of the upper Yukon, of which Mr. George M. Dawson will be in charge. It is proposed that one branch of the expedition shall proceed through the valley of the Stakeen River, cross the summit of the Rocky Mountains, and ascend the Liard River. Here they will pass the watershed between the Yukon and Mackenzie, and descend Pelly River. At Fort Selkirk, where the Pelly River joins the Yukon, they will meet the other branch of the expedition, which will proceed from Chitkat Inlet (Lynn Fiord) to the head waters of the Yukon. From Fort Selkirk, short expeditions will be made up the branches of the Yukon, on both sides, and down the main stream. W. Ogilvy, who will be in charge of this branch of the expedition, will remain in the district during the winter of 1887, but Dr. Dawson will return next fall by the route of Lynn Fiord. We are indebted to Dawson for his explorations in Vancouver Island, Queen Charlotte Islands, and the Rocky Mountains of British Columbia ; and we may expect that the proposed exploration, carried on under his skilful management, will be successful, and glean valuable results in the vast unknown north-western territories. It must be regretted that a survey of the boundary between Canada and the possessions of the United States cannot be undertaken at the same time, as both expeditions would help and further one another.

The French hydrographical office has published a map of the Cape Horn Archipelago and the Beagle Channel, from the surveys made by the steamer *La Romanche* during the years 1882 and 1883, when a polar station, according to the international plan, was established in Orange Bay. The map contains many important corrections of the coast-line.

The Instituto geografico Argentino has issued the first sheets of the 'Atlas de la República Argentina,' edited by Dr. A. Seelstrang. The basis of the atlas are the surveys of the land-office, railroads, and boundary commissions. It will consist of thirty sheets, each province being represented on a scale of 1 : 1,000,000.

Polynesia.

The eruption of Mauna Loa has almost entirely ceased, although steam is still issuing from fissures along the mountain-side. The activity in the crater of Kilauea, more particularly in Halema'u-ma'u (*vide* map in *Science*, ix. 181), is constantly increasing.

Polar regions.

The well-known Scotch whaler David Gray of Peterhead, who tried to find a new whaling-ground in the sea surrounding Franz-Josef Land, has failed to reach those islands, as the pack-ice extended far south, and was so closely packed that he was unable to enter it.

Mr. Alexander McArthur has returned from his 'trip to the north pole,' after having reached York Factory, and has given up his plans of proceeding by the Hudson Bay route.

NOTES AND NEWS.

THE Journal of the science college of the Imperial university of Japan, the first part of which has just made its appearance, may be regarded as a continuation of the scientific memoirs which have been from time to time published by the Tōkyō university. This journal is intended to be the journal through which the world at large may receive Japan's own contributions to the progress of science. One unique feature which will be apparent at once has regard to the language or languages in which the various papers are to be presented. Each contribution must be written in one of the three languages, English, French, or German, the choice being left entirely to the author. The necessity for this tri-lingual character springs, of course, from the very peculiar but well-known condition under which science has been cultivated in Japan and by the Japanese. The appearance of this journal is a strong commentary on the advance in culture in Japan, which, from being a country depending on the culture of foreign parts, is now beginning to return the debt.

— Our readers who are interested in astronomy will find an excellent guide for first explorations of the constellations in an illustrated article by Mr. G. P. Serviss ('Astronomy with an opera-glass — the stars of spring'), contributed to the *Popular science monthly* for April.

— A state board of health has just been organized in Vermont, making twenty-nine states which now have state boards.

— The *Medical record* quotes Dr. Mackenzie as being of the opinion that American catarrhs are largely due to the dust, and says that it is not unreasonable to believe that the tremendous clouds

of unsterilized earth which are driven into the faces of our city's population during this season have something to do with the excess of coughs and colds and the high mortality-rate during this period, which in some years is exceeded only in the hot months of summer.

— An experimental passenger-train, lighted throughout by electricity, and heated by steam from the engine, now runs between New York City and Boston. Each car is illuminated by eighteen 16-candle glow-lamps, the current being derived from storage-batteries hung beneath the floor-timbers, charged for ten hours by dynamos. Both light and heat are said to be ample; and danger from fire, in case of accident to the train, is much lessened, if not almost wholly done away with.

— Messrs. Estes & Lauriat, Boston, announce for early publication, 'Key to North American birds,' third revised edition, by Elliott Coues; also 'Key to North American birds,' sportsman's and tourist's edition.

— Among recent numbers of the Van Nostrand science series, we note the following: 'Petroleum, its production and use,' by Boverton Redwood, a reprint from the Journal of the Society of arts, London, with the omission of such portions as would seem to be of little or no interest to American readers; 'Leveling, barometric, trigonometric and spirit,' by Ira O. Baker, prepared originally as a part of the author's lectures on geodesy, given in the University of Illinois; 'Analysis of rotary motion, as applied to the gyroscope,' by J. G. Barnard, a reprint of the analytical exposition of the motions of the gyroscope, written by General Barnard in 1858 for the *Journal of education*; 'Beams and girders, practical formulas for their resistance,' by P. H. Philbrick, which aims to deduce general formulas for the resistance of beams and girders, applicable to all cases, and to set forth truly practical formulas so far as seemingly required in the use of existing forms and sections; 'Compressed gun-cotton for military use,' by John P. Wisser, a translation of the work of Lieutenant von Förster, with additions giving an outline of the present process of manufacture and a summary of the properties of the best form now produced.

— The fish commission will send the steamer Albatross to the Pacific coast next fall, to remain several years, and will make a thorough investigation of all matters relating to food-fishes. The cod, halibut, and other food-fishes are caught in the Pacific; but little is known of their distribution, and the fisheries have not been developed. The Albatross will also make investigations in the Gulf

of California. The commission has deposited during the last few years a large supply of young shad in the Colorado River, and the Albatross will visit the Gulf of California partly with the view of ascertaining the results of this work. The Thetis, which will cruise in Alaskan waters, will also make investigations, and the results of the work in arctic waters will be important in connection with the investigations of the Albatross.

— Capt. C. E. Dutton, chief of the bureau of volcanic geology of the geological survey, will read a paper at the next meeting of the National academy of sciences, which occurs the third week in April, embodying the results of the study of an immense mass of data upon the Charleston earthquake. The recorded rate of motion of earthquakes of history varies from three thousand to nine hundred metres per second. The data upon the Charleston disturbance prove conclusively that its earth-waves travelled between four thousand and five thousand metres a second, while French journals containing observations upon the Riviera shock give rates almost as high.

— It is believed that the department of agriculture's new departure in setting up machinery in Washington for winding the silk from cocoons will result in considerable extension of the silk-growing industry in this country. Great interest is manifested in the experiments, and the demands for copies of the bulletin on silkworm culture has made it necessary to issue seven or eight editions. Officials of the department say that the requests for silkworm eggs greatly exceed those received in any previous year since the department began their distribution. As a consequence, it is expected that large quantities of American-grown silk will be placed on the market this year.

— Commissioner of Agriculture Colman has returned to Washington from a recent trip to Louisiana to investigate the field for experiments in cane-sugar making by the diffusion process. He speaks highly of the mammoth plantation of Governor Warmouth, which has been selected for the work, and says, that, if the experiments in Louisiana are successful, the planters will be enabled to compete successfully with the beet-sugar interests beyond a doubt. Cane which would ordinarily yield eighty pounds to the ton will yield a hundred and forty pounds under the new process.

— A curious instance of lead-poisoning is reported in the *Medical news* by Dr. Bidwell of Vineland, N. J. The patient had been distilling domestic wine, using a coil of lead pipe for the worm of the still. Some of the wine had undergone acetic fermentation; and the acetic acid,

being less volatile than the alcohol, had distilled only at the last of the process, when, trickling through the lead pipe, it had taken up and carried with it the poison as sugar-of-lead. The patient had observed a slightly sweetish taste in the brandy which came over last. Some similar cases of lead-poisoning have recently occurred in England, due to the same cause; the acids of home-made wines having acted upon the glaze of the earthenware vessels in which fermentation has taken place.

— The assumed fact that plumbers' escape disease and infection from the inhalation of sewer-air is often referred to as indicating the harmlessness of this air or gas. Were all the facts known, this view would undoubtedly be much modified. A recent occurrence in England would seem to prove that men who follow this trade are not so exempt as is generally supposed. An inquest was held during the past month in Liverpool on the body of a plumber's apprentice who had been engaged during the previous week in repairing pipes which connected with a sewer. Quantities of gas came through these pipes, and at the time the young man complained of pain and sickness: in forty hours he died. The medical evidence was to the effect that death was due to the inhalation of sewer-air, and the jury rendered a verdict to that effect.

— Dr. Goto, of the Kakaako leper hospital in Japan, is said to be able to cure leprosy. Patients are bathed daily in warm water containing an infusion of Hichiyon bark, *Aesculus turbinata*, and sulphur. They are fed on a generous diet, and take internally the bark of the Hoang-nan tree, besides iron, quinine, and other well-known remedies. He reports that five of his patients are 'almost cured,' nineteen are improving, and seventeen are relieved.

— From the *British medical journal* we extract the following in reference to the duration of infectiousness in the diseases named: measles, from the second day, for exactly three weeks; small-pox, from the first day, under one month, probably three weeks; scarlet-fever, at about the fourth day, for six or seven weeks; mumps, under three weeks; diphtheria, under three weeks. While these may be reliable averages, we doubt very much whether any one can fix the exact period during which any of these diseases may be communicated, as is here done with measles. Some excellent authorities believe, that, even before some of these diseases make their presence known, persons exposed may contract them.

— Professor Dennis of New York recently made a number of interesting observations to test the

purity of the ocean-air while crossing the Atlantic. He had previously prepared capsules of sterilized gelatine. One, which was exposed in a state-room on the main deck of the steamer, developed five hundred points of infection in eighteen hours; one exposed in the cabin on the main deck developed only five or six points in ten days; a third, hung over the bow of the ship for ten days, remained uncontaminated.

— A parrot is reported to have died of diphtheria contracted from children sick with that disease in the same house.

— A new and complete edition of the writings of Galileo, in twenty volumes, is to be published at Florence under the authorization of the Italian minister of public instruction, who has nominated a committee of scholars to edit the work.

— We have received a communication from Professor MacGregor in reply to Dr. Hall's last letter on inertia-force, but we consider the subject to have been sufficiently discussed for the present.

LETTERS TO THE EDITOR.

**.*The attention of scientific men is called to the advantages of the correspondence columns of SCIENCE for placing promptly on record brief preliminary notices of their investigations. Twenty copies of the number containing his communication will be furnished free to any correspondent on request.*

The editor will be glad to publish any queries consonant with the character of the journal.

Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

Elementary instruction in zoölogy.

I was much interested in the letters of 'L. H.' and Mr. Shufeldt in regard to the teaching of zoölogy, and I am inclined to agree, almost without qualification, with the latter.

It is unnecessary to make any distinction between a high school and a college course; for at the present time they are practically identical, inasmuch as few college students have had any zoölogical training in their preparatory course. Is, then, the course indicated by 'L. H.' a wise course for the general student? My experience leads me to believe that he is almost as far from the *best* course as the old style of teachers whose work was undeniably superficial.

The theory of studying one animal thoroughly, then taking up nearly related forms, and gradually extending the study to the whole animal kingdom, is very plausible; but has 'L. H.' tried it with an ordinary college class, and in the time allotted to zoölogy in the ordinary college course? He indicates a course that would require several years of continuous work, while most colleges give from one to three terms, and allow for only a limited amount of laboratory work.

Now, while zoölogy is a science worthy of being taught *for itself* and for the discipline it affords, it

has a bearing on other sciences, and this second element must not be lost sight of. For example: to understand geology, the student must know the principles of classification of animals; but the method of 'L. H.' would never bring the average student to knowledge of classification. He would know about crustaceans perhaps, but might in reality know very little of zoölogy.

I find I get the best results by following a method which is essentially like that outlined by Mr. Shufeldt. First my students dissect, in a somewhat superficial manner of course, a series of types. For this work I find that even a manual like Colton's tells too much: for I wish to have students, first of all, learn to use their own eyes, and not simply to verify some one else's description. For this stage of the study the less of text-book and the fewer works of reference, the better. In order that material may not be wasted, I furnish my students a little pamphlet of elementary instruction, which tells them what to do, but not what they will find.

This work forms a basis for teaching classification, which I do largely by lectures, or rather talks.

This elementary work gives the student a fair general idea of the animal kingdom. That his knowledge is superficial, I acknowledge, but I consider it none the less valuable. Now the student is prepared to make a thorough study of some higher animal. We use the cat, and from the cat teach the comparative anatomy of vertebrates. More advanced students take up histology and embryology.

I do not think that in this course we have reached the ideal; we may make great changes in it: but it seems to us the best according to our present knowledge.

I am inclined to think that the compound microscope is used too freely with elementary classes; that it would be better if all of their work for the first term or two were on macroscopic anatomy, and that the microscope should be brought in only when the student actually feels the need of it to pursue his investigations further. This is the method of nature, and it seems to me more profitable. C. D. M.

Ripon, Wis., March 30.

Lepidoptera at sea.

On the evening of March 5, 1870, it was my fortune to be on board ship, bound from Callao for London, and at that time a little more than a thousand miles from Cape Frio, the nearest portion of the coast of Brazil. We were in latitude 25° south, longitude 24° west, just south of the border of the south-east trade-winds. Late in the afternoon we encountered several light squalls of wind and rain, during one of which two butterflies were driven past. The weather continued squally all night and for part of the next day, the wind coming from the westward. The following morning it was found that quite a number of Lepidoptera had been blown on board, and ensconced themselves in various places sheltered from the wind. They were mostly, if not wholly, nocturnal species of small size, although one large hawk-moth was among them. About twelve or fifteen specimens, representing nearly as many species, were captured, and others seen; so that not less than twenty or thirty individuals must have reached our ship.

It would appear from this abundance that the total number swept out to sea must have been ex-

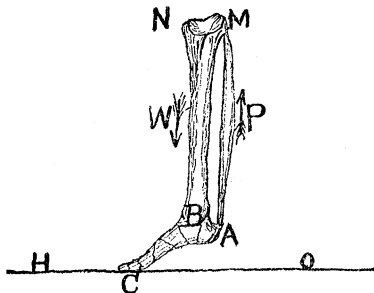
tremely large. Travelling even at the rate of forty miles an hour, these moths must have been on the wing at least twenty-four hours, in many cases exposed to the rain. The specimens captured seemed by no means exhausted, and could probably have prolonged their flight to a much greater distance. It has seemed best to place this occurrence on record even at this late day, as showing how readily islands may receive important additions to their fauna from very distant quarters.

FREDERIC A. LUCAS.

Washington, March 30.

On tiptoe.

The letter of Prof. F. C. Van Dyck (*Science*, ix. p. 235) in relation to the mechanical problem involved in standing on tiptoe seems to be somewhat misleading, in so far as he insists that it is *not* a lever of the *second* order. As the lever of the second order is defined to be that in which the weight, or resistance to be overcome, is between the fulcrum and the power, and as in this case the ground is the fulcrum, and the power is applied at the heel, it is evidently a lever of the second order. Moreover, if the power applied at the heel reacted on something exterior to the bony mechanism, the case would be simple and obvious. But inasmuch as the power, or contracting muscle of the calf of the leg, is attached both to the heel and to the head of the tibia, the efficacy of the power is thereby modified. But it does not alter the defined order of lever: it merely augments, to the extent of the reaction, the resistance to be overcome in raising the weight resting on the ankle.



Thus, in the annexed figure, assuming that the forces producing equilibrium act in parallel directions, and regarding it as a lever of the second order, in which *C* is the fulcrum or centre of moments, for conditions of equilibrium we have, $P \times CA = W \times CB + P \times CB$. $\therefore P \times CA - P \times CB = W \times CB$. $\therefore P \times AB = W \times CB$. $\therefore P : W :: CB : AB$. Hence, while by the position of the fulcrum *C* it is actually a lever of the *second* order, yet, by virtue of the reaction of *P*, it is mechanically equivalent to a lever of the *first* order.

In an analogous manner, it seems to me that the confusion and perplexity in relation to the 'boat-oar' problem might be cleared up (vide *Phil. mag.*, xxiii. pp. 58, 224, 1887). It is scarcely necessary to add that the foregoing solution of this problem is very old: if I am not mistaken, it may be found in one of the editions of Dr. Golding Bird's 'Elements of natural philosophy,' published more than twenty years ago.

JOHN LECONTE.

Berkeley, Cal., March 23.

The loss of the Tonquin.

It has generally been stated that the Tonquin, which figures so prominently in the history of the north-west coast, was destroyed at Nootka. Bancroft accepts this version in his 'History of the north-west coast' (1884); while others, following Greenow (1840), place the occurrence at Clayoquot, both these places being on the west coast of Vancouver Island. The facts so far as known, however, appear to me to point to Na-wi-ti, on the north coast of Vancouver Island, as the true locality.

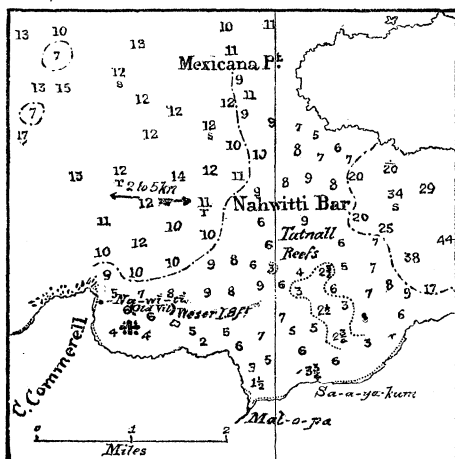
The Tonquin, it may be remembered, was a vessel of 290 tons burden, belonging to Astor's American fur company. After reaching Astoria, in the mouth of the Columbia, in 1811, she was despatched on a trading-voyage to the north, leaving Astoria on June 5. It is unnecessary to detail the circumstances leading up to the attack on the vessel while at anchor, the massacre of the crew, and the subsequent explosion of the magazine, by which the vessel was destroyed and a large number of natives who had crowded on board were killed. The facts were subsequently obtained from a Chehalis Indian interpreter, who alone escaped, and are recorded by Ross Cox and by Franchere in 'The Columbia River' (1832) and 'Narrative of a voyage to the north-west coast of America' (1854) respectively. The name of the locality, as given by the Chehalis interpreter, is alone sufficiently distinctive, and I can account for the circumstance that its correspondence with Na-wi-ti has, so far as I am aware, been overlooked, only by the fact that this name has not usually appeared on the maps, though to be found as 'Nah-witti' on the detailed charts of the coast. Bancroft, indeed, denies the existence of any such name as that given by the interpreter and adopted by Franchere, and afterwards by Irving in 'Astoria' (*op. cit.*, p. 155).

The Indians known as the Nawitti by the whites, comprising the Tlā-tli-si-Kwila and Ne-kum'-ke-lis-la sept or tribes of the Kwakwaka'wakw people, now together inhabit a village named by them Mel'-oopa, on the south-east side of Hope Island. Their original town was, however, situated on a small rocky peninsula on the east side of Cape Commerell, which forms the north point of Vancouver Island. Here remains of old houses are yet to be seen, and the place was and still is by the Indians known as Na-wi-ti.

Ross Cox, who came into personal contact with the escaped Chehalis interpreter, writes of the loss of the Tonquin, "A few days after their departure from the Columbia, they anchored opposite a large Indian village, named New-Whitty, in the vicinity of Nootka, where Mr. McKay immediately opened a smart trade with the natives." After giving the relation of the interpreter as to the massacre and explosion, he describes the escape of three (four according to Franchere) of the crew in a boat: "They rowed hard for the mouth of the harbor, with the intention, as is supposed, of coasting along the shore to the Columbia; but after passing the bar, a head wind and flowing tide drove them back, and compelled them to land late at night in a small cove," where they were afterwards found and killed by the natives. Franchere's version of the story is much the same with that of Cox, except that he gives the name as 'Newity,' and in another place as 'Newitti' (*op. cit.*, p. 180).

Though moderately well sheltered, the little bay at Na-wi-ti is stated in the *Vancouver pilot* to be unsuited for an anchorage by reason of its rocky bottom. It is nevertheless the first place on the north shore in which a seaman would naturally seek for an anchorage after rounding Cape Scott in the absence of a chart, and was, besides, adapted to the purpose of the traders as being the site of a large village. The mention by Cox of a bar over which a strong tide runs, again agrees with the fact of the existence of the notable 'Nahwitti Bar' of the charts, of which the writer had a somewhat perilous experience ten years ago, while bars are not found at the entrances of Nootka or Clayoquot sounds.

When at Na-wi-ti in 1885, I learned from the Indians that some disastrous event had happened at this place, but could not learn its precise nature. Dr. Franz Boas informs me that he also was unable to gather any thing definite on the subject from the natives. It is probable, however, that the shelling



of this village by a gunboat, which occurred about forty years after the loss of the Tonquin, may have since become confounded with that event, if it really happened at this place.

The point at which the Tonquin is supposed to have been destroyed is indicated by the asterisk on the accompanying plan, which is based on Admiralty chart No. 582.

GEORGE M. DAWSON.

Geol. surv. Can., March 30.

A sensitive wind-vane.

The liquid damper suggested by 'T. C. M.' in *Science*, No. 217, certainly furnishes a complete and satisfactory solution of the wind-vane problem. This device is a customary method of checking oscillations, and its application to the wind-vane was made about ten years ago by Mr. J. W. Osborne, who constructed and used such an apparatus (*Amer. assoc. report*, 1878). His definition of an ideal vane agrees entirely with the conditions laid down by Professor Mendenhall, and is worth quoting: "A perfect wind-vane should instantly respond to the slightest change in the direction of the wind, and should remain stationary when it has made the necessary angular movement."

A single, but perhaps not unimportant, exception may be taken to Professor Mendenhall's solution,—"to use a *small* and extremely light vane." Lightness is, of course, a desideratum in order to reduce friction, but length is also requisite in order to give sufficient gyratory force for very light winds. The vane may be extremely light, and yet not small. Mr. Osborne's vane, designed to realize his definition, was *seven feet long*, and weighed only three ounces. Sensitiveness is increased, 1° , by increasing the moment of rotation: 2° , by diminishing the friction. An addition to the length of a vane, if it is of light material and mounted on friction-rollers, may add more to the sensitiveness by increasing the moment of rotation than it will subtract by increasing the friction.

G. E. CURTIS.

Washington, D.C., April 4.

The difficulties which have been discussed in the last few numbers of *Science* in regard to a sensitive wind-vane are avoided at Blue Hill observatory by having the wind-vane self-recording.

The recording is by the Draper method; viz., a cylinder is attached to the spindle of the vane, and a stationary pencil (except that it is slowly dropped by clock-work) records the oscillations of the wind on the cylinder. The vane is thin metal, has a divided tail, and is sensitive to the lightest wind. In order to determine the direction of the lightest or most violent wind, a line is drawn through the centre of the oscillations recorded on the cylinder. It is not uncommon for sea-clouds to drive by almost touching the top of Blue Hill; and, by means of a mirror devised for measuring cloud-movements, their motion can be determined within one or two degrees of arc. I have made a number of such measurements, and find that they correspond almost exactly with the centre of the wind-oscillations on the cylinder, determined in degrees of arc.

This method of recording the wind-direction is simple, accurate, and easily managed, and I do not think it would cost very much more than the method Professor Mendenhall suggests of fitting up the vane. Hence I hope, if improvements in wind-vanes are attempted by the signal service, they will turn their attention to the very desirable method of continuous registration.

H. HELM CLAYTON.

Blue Hill meteor. observ., April 3.

Physiology of plants.

I notice that in a review in *Nature* of the 26th of August, 1886 (p. 381), of Dr. Vines's 'Lectures on the physiology of plants,' it is stated that the view that "the cell-wall is produced by the actual conversion of a layer of protoplasm," and that "the starch which is formed in chlorophyll corpuscles under the influence of light is also the product of such a dissociation of protoplasm," is "the most striking novelty which will be found by English readers" in Dr. Vines's book, "and, though propounded some years ago in Germany, has now, we believe, appeared for the first time in an English text-book."

In reference to this, will you kindly allow me to point out that the above view was propounded by myself, and will be found fully set forth, along with an explanation of the chemical reactions involved, on pp. 218-223 of my book, 'Light the dominant force of the universe' (London, Sampson Low & Co., 1882).

W. SEDGWICK.

Calcutta, Feb. 15.

SCIENCE.—SUPPLEMENT.

FRIDAY, APRIL 8, 1887.

EFFECTS OF EXPLOSIONS ON THE EAR.¹

THAT the ear may be injured by the violence of aerial impact, or concussive force, propagated by the explosion of gunpowder, has been known ever since the introduction of explosives in military warfare. Owing, however, to the obscurity of traumatic lesions of the drum of the ear, or of its deeper parts, and the limited means of observation at the command of the military surgeon in the field, it has been more difficult to study these injuries than most other wounds. Such was my own experience, at least; and reference to the literature of the subject shows that the opportunities of writers on military surgery were probably no greater in this respect. It is a fact, moreover, that from the suffering occasioned by other and more painful wounds simultaneously received, together with the bewilderment caused by nervous shock, aural injuries are liable to be entirely overlooked. Indeed, in some of the cases about to be described, there were serious wounds of the ear, of which the wounded men themselves had been unconscious up to the time of my examination, several weeks after the accident. It may be stated here, on the contrary, that after artillery engagements it is not unusual for participants to fancy that deafness, due to other causes wholly, has been produced by the loud sounds of great guns; and, since the war of the rebellion, applicants for pensions not infrequently present their cases with the statement that aural disability has originated in this manner.

While the writer was recently seeking information from persons having had experience in the field or on shipboard, especially among army and navy officers, an opportunity quite unexpectedly presented itself to investigate thoroughly the effects of concussive force on the ears of a number of men in the midst of whom a twelve-inch mortar-shell, weighing five hundred and eighty-five pounds, and containing a bursting charge of twenty-seven pounds of rifle-powder, was accidentally exploded. This took place at the U. S. ordnance proving-ground, Sandy Hook, Oct. 21, 1886, at 3.30 P.M.

The scene of the catastrophe, as shown in fig. 2,

¹ Condensed from the *Medical record* of Feb. 19, 1887, with illustrations reproduced by permission of Wm. Wood & Co.

was reproduced from a photographic view taken on the spot by my friend Mr. Walter C. Tucker-man. The men were taken in about the same positions they occupied at the time of the accident. The places of three of them—namely, Lieutenant Medcalfe and Private King, killed, and Corporal Goodno, absent in hospital—were occupied by other persons.

The diagram of the twelve-inch mortar, gun-carriage, and platform (fig. 1), where the firing was taking place, was kindly designed by Captain Whipple. The facings of the men are designated by arrows, and the direction and force of the wind at the time are also shown. The distance of the men from the shell which exploded was as given below:—

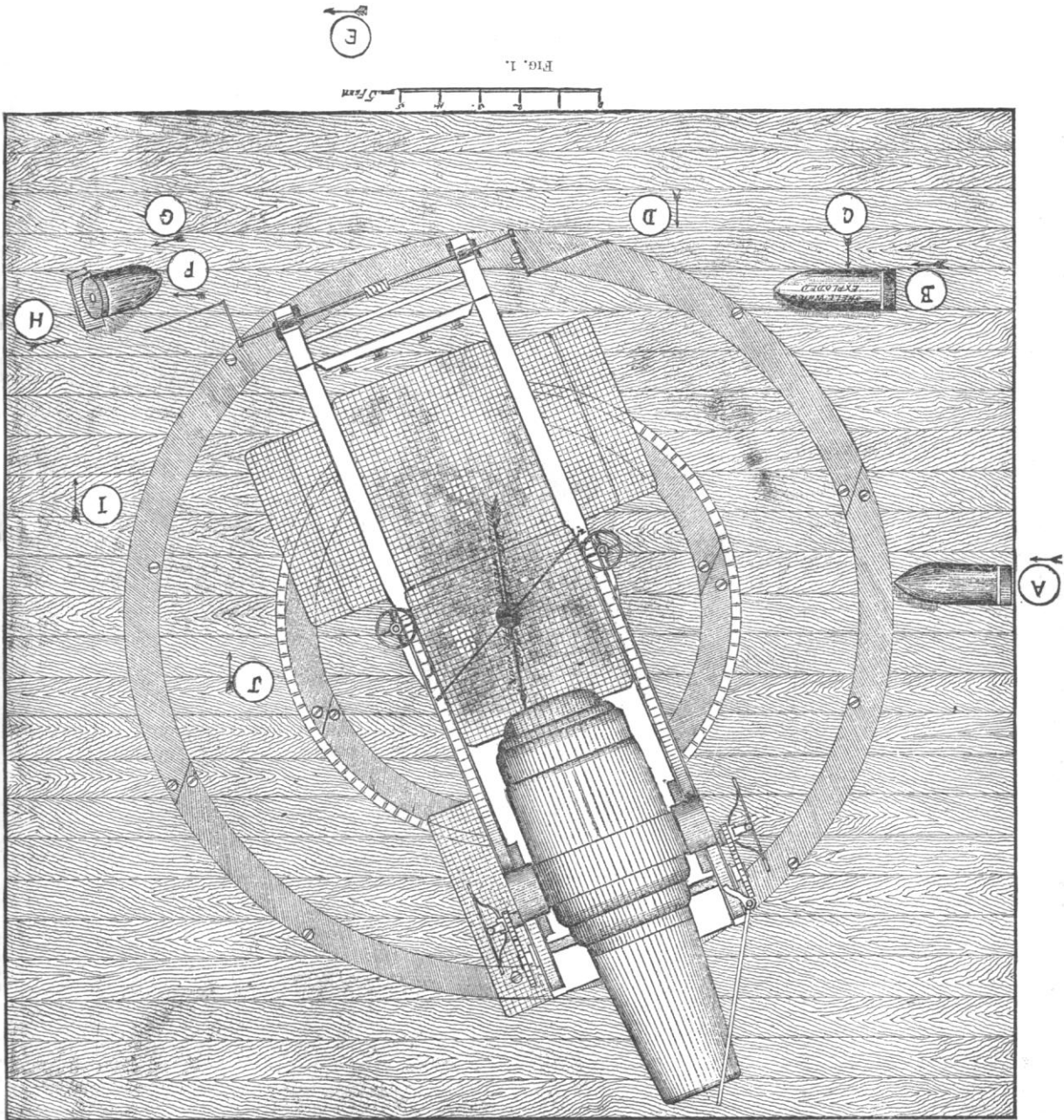
A. Sergeant Abbott, position 8 feet from the shell.	
B. Private King, " at the base of the shell.	
C. Lieutenant Medcalfe, " at the side of the shell.	
D. Corporal Clark, " 4 feet from the shell.	
E. Corporal Goodno, " 12 " " " "	
F. Private Cunningham, " 15 " " " "	
G. Private Cramer, " 15 " " " "	
H. Mr. Sinclair, " 19 " " " "	
I. Private Burns, " 19 " " " "	
J. Corporal Ingram, " 16 " " " "	

Sergeant Abbott was blown ten feet from his position; Private King (who was closing the screw plug in the base of the shell with a drift and hammer, and thus exploded it) was instantly killed, and his body was blown fifty-five feet away; Lieutenant Medcalfe, who was standing by the side of the shell, was blown twenty-two feet, and died in thirty minutes; Private Clark was blown fifteen feet. The other six men kept their feet during the explosion. Eight men thus escaped with their lives, but all of them were more or less injured by the concussion, and some of them received contused wounds or were burned by the blast.

As might have been expected, the immediate effect of the severe concussion caused by the blast of the explosion just described was dumfounding in the extreme, so far as most of the persons in the immediate vicinity were concerned. The mental confusion which ensued in some of the cases lasted a long time, and in one instance, that of Corporal Clark, it is doubtful if complete recovery ever takes place.

In some of the cases the absence of prominent symptoms of injury of the ear, such as pain in the organ, tinnitus, deafness, or discharge, was noticeable. Soldiers are, however, as a rule, accustomed to endure hardship without complaint, and, in

fact, all insensitive persons are liable to overlook ear-disease until incapacitated to perform their work. It was only after persistent inquiries in each one of the cases reported was dependent on the distance from the shell, the facing at the moment of explosion, and the size of the external



were made that some of these persons would admit that they had suffered any injury of the ear. The extent of the injury of the drum of the ear

and Sinclair, the drum-heads were driven in with and in the cases of Abbot, Clark, Goodno, Ingram,

such force as to cause their complete destruction by death of the tissues. In some of the cases it will be observed that partial or entire reproduction of the drum-head took place. The spontaneous cure, in most of these cases, without leaving any discharge, affords a valuable suggestion in the treatment of inflammation of the ear, as well as in operations on the organ, in healthy persons. It is believed, notwithstanding the great destruction of the membrana tympani, that the chain of ossicles has been left in every case. It is fortunate for man that great augmentation of tension, exerted either from without or from within,

Connecticut, 'discharge of cannon'.....	1
Georgia, 'firing cannon in war'.....	1
Indiana, 'cannon fired'.....	1
Illinois, 'gunshot wound'.....	1
Massachusetts, 'discharge of cannon'.....	1
Minnesota, 'from a shot'.....	1
Missouri, 'jar from cannon'.....	1
Nebraska, 'heavy cannonade in France'.....	1
New York, 'report of gun'.....	1
Ohio, 'discharge of cannon'.....	1
" 'severing of tongue cords by shot'.....	1
Pennsylvania, 'shot of gun'.....	1
Texas, 'gunshot wound'.....	1
" 'gun fired close to ear'.....	1
Wisconsin, 'firing cannon'.....	1
Total.....	15

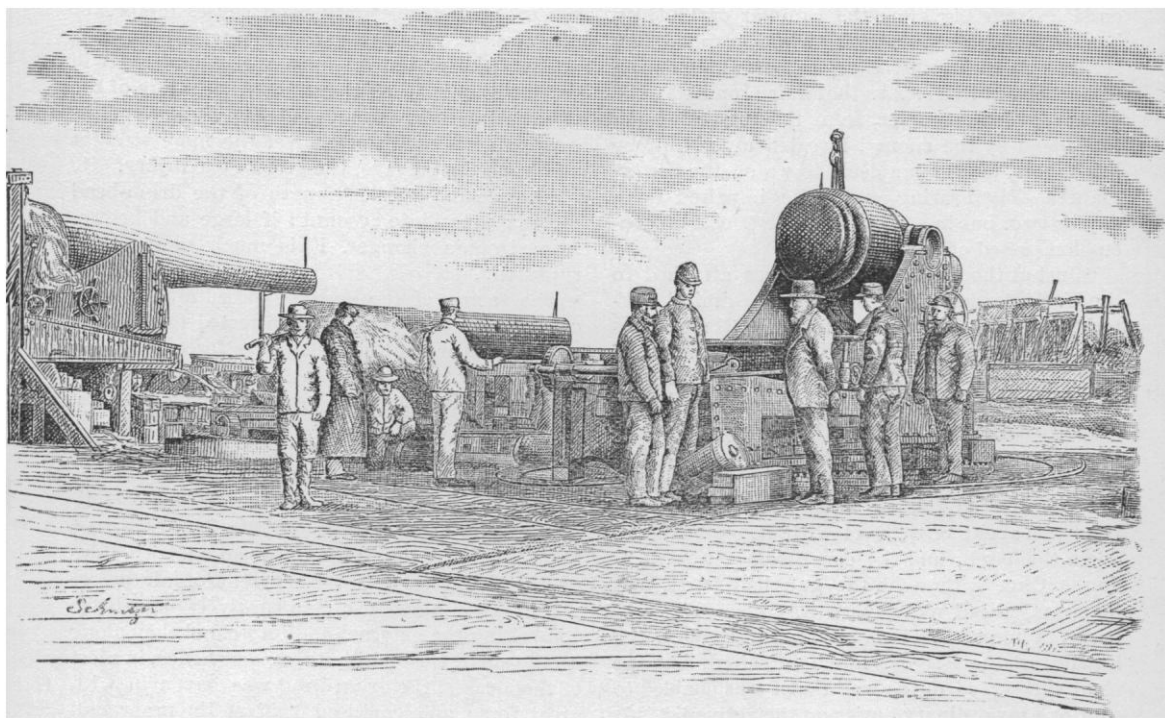


FIG. 2.

upon the transmitting mechanism of the ear, may be experienced without serious injury to the stapes or labyrinth.

I have endeavored to obtain some reliable statistics in regard to the frequency of injuries to the organ of hearing during the late war of the rebellion, but without satisfactory results: thus, the number reported by the census-takers in 1880, as furnished me by Mr. Fred. A. Wines of the census bureau, was only fifteen from all causes. These are given below. The meagreness of facts obtained in this manner illustrates the inefficiency of such a method for collecting valuable information. A single shell-explosion has, in many instances, doubtlessly injured as great a number.

The pension-office, doubtless, might furnish more reliable statistics were the disabilities for which pensions were granted tabulated; but congress has, as I am informed by Medical Examiner Wood, omitted to make any appropriation for such work. It is to be regretted that more attention has not been given to this matter, since there must be a large number of persons who have suffered injury to the ears from the concussion of explosives, who are as much entitled to be pensioned by the government from this cause as from others which happen to be more easily diagnosed.

I have obtained some facts, in conversing with officers who served during the war of the rebellion, which may be of interest. Commander

Robeson, at the naval attack on Fort Fisher, found that the continued explosion of fifteen-inch shell at close quarters gave rise to very disagreeable ringing in the ears, which finally benumbed the hearing sense so much that he could not hear an order given on deck for several days: the disability, however, was but temporary.

I am in receipt of a communication from Medical Director Henry O. Mayo (retired), U.S.N., giving his own experience as to the effect on the ear of the concussion of great guns, which is of much interest, since it shows the effect of repeated injuries. He says, "I first felt the effects of concussion from big guns the summer of 1861, on board the frigate Savannah, while engaged in a scrimmage with some rebel gunboats at the mouth of the James River. As the affair promised to be of a bloodless character, from the respectful distance kept by the enemy, I seated myself in the bridle-port, on the gun deck, to watch the performances. My hearing was quite impaired for a day or two, but in a short time the effects of concussion passed off entirely.

"Just at the close of 1864, I was attached to the U. S. steamship Powhattan, of Admiral Porter's fleet, and was engaged five days (three at one time and two at another) in the bombardment of Fort Fisher and the other batteries at the entrance to Wilmington. Having occasion to go on deck at times during the action, I could only do so by the cabin companion-way, which was but a few feet from the eleven-inch pivot gun. This chanced to be discharged two or three times, just as my head was about on a level with it, going up or down the hatch, and the concussion was tremendous. Once I thought the gun had burst, and taken my head along with it. Upon reaching home, a month or two afterward, I found the hearing of the left ear much impaired, but the right still served me so well that I was enabled to continue my ordinary duties on the active list.

"In the early part of 1870 I went to China as surgeon of the Asiatic fleet. During this cruise I was exposed for one entire day to the concussion of big guns engaged at target-firing on board the flagship Colorado. This gave the *coup de grace* to the hearing of the left ear, and still further impaired that of the right. In 1875 I was retired on account of deafness."

Dr. Mayo is of the belief that the cause of the defectiveness lies in the transmitting mechanism of the middle ear, and not in the inner ear, or auditory nerve-tract. The Eustachian tube of the left (worst) ear has always seemed abnormally pervious, while the right was considerably obstructed. He cannot hear the loudest-ticking watch pressed against the left ear, and only faintly

in the right. He can converse pretty well with one person, at close range, who speaks slowly and distinctly.

In general, it may be said that the concussion of great guns is much less in the rear of the piece than just over it or at one side, and that the more in advance, the greater the exposure to the blast. On shipboard a gun's crew is usually stationed from four to eight feet to the rear of the muzzle, and, when protected by bulwarks and decks, experience no special inconvenience; but, if the ear happens to be on the same plane as the face of the muzzle, the effect at a distance of a few feet is disagreeable, or even painful, and causes temporary deafness.

The force of impact upon the drum-head will depend somewhat on the size and curvature of the external auditory canal and the rigidity of its cartilaginous walls: of course, the more straight and large the passage, the greater the injury.

The size and tensile strength of the drum-head must be taken into account: if large and brittle, from trophic changes, it is much more easily ruptured.

The facing of the person exposed must also be considered: usually the ear directed toward the object from which the concussive force is propagated suffers most; but in the case of Ingram it was otherwise, the sound-waves having been reflected.

The immediate effect of the blast-impact in the cases injured by the shell-explosion at Sandy Hook was undoubtedly upon the exterior surface of the drum-head mainly. While it is true that atmospheric tension is almost equal on both sides of the drum head, yet a current of air passes much faster along the comparatively large tube comprising the external auditory canal than along up the small Eustachian tube; and hence, in most of these cases, the drum-head was driven in with great force, and contused against the inner wall of the tympanum and the retained air. The effect of such violent concussion is to cause the death of the membrane.

The momentum of sound-waves may ordinarily be estimated by the application of the law of central forces, the force being inversely to the square of the distance. The effects, practically, of such intense concussive force, however, cannot be measured by rules governing sound ordinarily, since it has been found by experience, that, instead of finding himself surrounded near the breech of the gun by highly rarified air, the experimenter may be subjected to quite an opposite condition; namely, one of condensation. In the former, intra-tympanic air would rush outwardly, carrying the drum-head before it. In confirma-

tion of this allegation, the puzzling experience related to me by Captain Shaler may be cited: "The window-glass of the officers' quarters, at the testing-grounds at Sandy Hook, situated some three to five hundred feet to the westward of the gun park shown in the picture, are liable to be shattered by the concussion of large pieces in practice, and it has been found that the glass is forced *outward* at one time, and *inward* at another." Regarding the drum-heads as window-glass under like conditions, we might find them ruptured by compression from without in one instance, and by distention of intra-tympanic air in another.

All of us are aware of the difficulty of ascertaining the source of sound in a sea-fog, where vapor-tension varies in a much greater degree than inland. Professor Henry described the reflections of sound which here take place as 'acoustic shadows,' — a picturesque comparison, recognizable by every one familiar with those similar phenomena, namely, the reverberatory detonations of thunder during a storm, where clouds or mountain-peaks intervene. It is to the unrecognizable 'vapor-peaks' that many unexplained and puzzling acoustic manifestations are due. In the case of Corporal Ingram, cited, the wave from the blast did not nearly so much affect the right ear, which was turned toward the shell, as the left one, the sound having been apparently deflected from its course by the heavy gun-carriage intervening.

Experiments are wanting to determine the windage¹ of balls. This must depend on their size and velocity, nearness of passage, and the force and direction of the wind. There seems to be no doubt but that the windage of a cannon-ball might rupture the drum-head of the ear. The compression of the air before and around the ball, I am informed by my friend Prof. A. M. Mayer, is considerable; and the *velocity* of the compression is equal to that of the ball, which velocity may even exceed that of wind itself. So an *aerial blow* of such a mass of air, at such high velocity, is probably quite sufficient to rupture the drum-head.

The size and force of modern military explosives having been greatly increased of late years, much more injury to the ear is likely to occur in future than has been recorded of the past, though the number of accidents from premature discharge, or from exposure to the blast in firing breech-loading

pieces, must be less than when muzzle-loaders were in vogue.

It is the experience of many officers that the vibrations of great intensity which are given off from some field-pieces and bursting shells, charged with high explosives, are more disagreeable than the heavier sounds of great guns. The metal itself vibrates under these circumstances similarly to a tuning-fork.

A very disagreeable jar is imparted to the temporo-maxillary articulation when the individual is near a great gun being fired off. This is lessened, it is believed, by standing on the toes and leaning forward. Some simple precaution, to be employed by officers and men during artillery practice, would seem very much needed, since aural shock is not only painful and distressing, but orders cannot be well heard while the confusion lasts.

There is probably no better protection than a firm wad of cotton-wool well advanced into the external auditory canal. In suggesting this protection, it is believed that harm can seldom take place from pressure of air from within, since it is known that the violent introduction of air into the tympanum from the throat, by means of Politzer's method of inflation, seldom ruptures the drum-head; though, if such a volume of air were suddenly driven into the external auditory canal, the drum-head would in nearly all cases be ruptured.

The writer, in finishing this account of the aural injuries done by the explosion, would request that other observers having experience in this direction kindly communicate with him. Any knowledge that may thus be contributed would be of service to military surgeons, otologists, and others.

SAMUEL SEXTON, M.D.

MINING INDUSTRIES AND MINERAL RESOURCES OF THE UNITED STATES.

Tenth census of the United States. Vol. xv.: Report on the mining industries of the United States (exclusive of the precious metals). By RAPHAEL PUMPELLY. Washington, Government. 4°.

THIS report supplements those previously issued on the precious metals, and on petroleum, coke, and building-materials; and these volumes together constitute a very complete account of the mining and quarrying industries of the country for the census-year.

The appearance of this volume, nearly two-thirds of a decade after the close of the census-year, is neither timely, nor creditable to those responsible for the delay; for the practical interest and usefulness of works of this class, except, perhaps, for students of economics, diminish rapidly

¹ 'Windage', it should be said, is a technical term used in military parlance to indicate the difference in diameter between the bore of a gun and its projectile. The word has been, perhaps improperly, adopted by writers on military surgery, in which sense it refers to the impact of the condensed air surrounding a missile passing near any part of the body.

with the lapse of time. Fortunately, however, this volume also possesses features of more permanent value than mere statistics, to the students of American mining and geology. This is especially true of the extended section on the iron ores, which certainly is a boon to every student and teacher of economic geology. The treatment, both statistically and geologically, is well-nigh exhaustive. The geologist will find here a profusion of maps, sections, and diagrams, showing in all desirable detail the geographical and geological distribution of all the principal varieties of iron ore mined in this country; with an account of the extent, structural characteristics, and chemical composition of every important deposit, and, in most cases, of every important mine. The geological material, where not original, is collected from widely scattered and comparatively inaccessible sources; so that, even if regarded merely as a compilation, this treatise on the sources of our most valuable metal ranks, as a contribution to the popular knowledge, with the most important monographs of the national survey. Of the statistics of the production of iron ore in the census-year, it is sufficient to say, that, like the statistics of the tenth census generally, they are very full, and are presented in every interesting and instructive aspect.

The section on the iron ores is followed by that on the coals: and this part of the report is, for the eastern United States, very summary, and chiefly statistical; the statistics being illustrated, however, by a series of maps showing the general distribution of the coal-measures, and the production by counties. In his meagre description of the coal-fields of the eastern United States, Professor Pumpelly has evidently been influenced by the fact that very satisfactory accounts of most of them are now accessible to the public in various general works and state reports, and especially in the report of the second geological survey of Pennsylvania.

But any deficiency here is fully compensated in the very full report on the cretaceous coals and lignites of the north-west, especially on the line of the Northern Pacific railroad, in Montana and Washington Territory.

In short, Professor Pumpelly has made this volume a medium for the publication of some of the results of the northern transcontinental survey, carried on for two years (1881-83) under his charge. It is a substantial and timely contribution to our knowledge of the geology and resources of the most imperfectly known section of the country. The report is profusely illustrated by beautifully drawn maps and sections.

The remainder of the volume is devoted mainly

to the usual statistics of the production of the base metals, — copper, lead, zinc, — and of the minor economic minerals, such as mica, asbestos, asphaltum, barytes, chromic iron, emery, graphite, kaolin, etc.; but it concludes with an extended and well-arranged directory of the mines and metallurgical establishments east of the 100th meridian, and of the mines of bituminous coal and lignite in the eastern states and territories.

Mineral resources of the United States, 1885. By DAVID T. DAY. Washington, Government. 8°.

This is the third of the series of annual octavo volumes on the development and production of the mines of the country, published by the U. S. geological survey; and since it represents the condition of the mining industries at the middle of the decade, it supplements in an important way the census volumes already referred to, bringing the statistical portions of these, especially, nearly up to date. These annual volumes cover the entire range of economic geology, including building-materials and fertilizers, and, besides the statistics of production, are replete with descriptions of new developments, and notes on the condition of allied industries, and on processes for utilizing materials which have no value at present.

SOME AGRICULTURAL REPORTS.

Report of the viticultural work during the seasons 1885 and 1886. (Univ. Cal. coll. agric. rept., 1886, Appendix No. 6.) By EUGENE W. HILGARD. Sacramento, State. 8°.

THIS report records the continuation and extension of Professor Hilgard's well-known viticultural work of former years, which has done so much towards developing the wine industry of California, and placing it upon a rational basis. The general scope and purpose of this work, as defined by Professor Hilgard, is to aid in "the establishment of more definite qualities and brands, resulting from a definite knowledge of the qualities of each of the prominent grape varieties, and of their influence upon the kind and quality of the wine in blending."

With this end in view, work has been done chiefly in three directions, — first, as a means of rectifying nomenclature and aiding in identifying varieties, a standard vine collection is being formed; second, a considerable number of samples of grapes have been made into wine on a small scale at the viticultural laboratory, and the course of the fermentations and aging of the wine and the quality of the product have been followed; third, representative samples of wine from different localities, and different varieties of grapes, have been analyzed. Some comparative experiments upon different methods of fermentation

have also been made, and a considerable amount of work upon vine-diseases is reported.

Annual report of the Connecticut agricultural experiment-station, for 1886. New Haven, State. 8°.

Like most of the experiment-stations of the eastern states, the Connecticut station is largely occupied with the analysis of commercial fertilizers; about one-half of the space in the report for 1886 being occupied with the results of this work, while a considerable portion of the remainder is taken up with the analyses of feeding-stuffs sent to the station for examination, and other matter connected therewith.

Numerous analyses of milk and of butter and butter substitutes have been made, the latter for the state dairy commissioner, and also a few ash analyses of feeding-stuffs.

The most noteworthy portions of the report are the papers upon 'The agricultural value of horn-dust and of hoof and horn,' and upon 'Methods of mechanical soil analysis.'

In the former the method of pot experiments with fertilizers, worked out with great care and labor by Wagner, was applied, for the first time in this country, so far as the writer is aware, to the solution of an important practical question. It is to be hoped that further experiments of this sort by this and other stations may supplement their work on the analysis and commercial valuation of fertilizers.

The paper upon 'Methods of mechanical soil analysis' gives the results of tests of a new method, styled 'beaker elutriation,' by which a soil may readily be separated into sediments of any desired fineness in a very simple and expeditious manner, and without the use of expensive apparatus. Should the method prove, upon further trial, to be as accurate as these trials indicate, it will be a very substantial addition to our means of studying the physical properties of soils and their relations to fertility.

Mention should perhaps be also made of the notes upon analytical methods, which contain much of interest to the chemist. The report, as in previous years, shows that the work undertaken has been most thoroughly and conscientiously done. One can but regret that so great a proportion of the time and energy of the station's officers is taken up by routine work, and so little is available for really scientific investigation.

Fifth annual report of the board of control of the New York agricultural experiment-station, for the year 1886. Elmira, Advertiser assoc. pr. 8°.

As in previous years, the report of the New York experiment-station is largely devoted to the elaboration of the directors' idea of an agricultural botany; wheat, cabbage, and lettuce being

the plants chiefly studied during the year, — the first by the first assistant, and the other two by the horticulturist. The attempt is made to classify the large number of varieties given and described into 'agricultural species' with distinct and reasonably permanent characters. It would appear that the success of the gentlemen interested with these tasks has not always been commensurate with their desires; but this was to be expected in such a comparatively new field, and any very vigorous criticism of the results would be premature.

In connection with these studies, a large number of collateral points have received more or less attention, many of them important in themselves, but so superficially treated as to render the results of the trials of little or no value. It seems to be very difficult for those in charge of these experiments to restrain themselves from following up for a little distance any collateral inquiry which suggests itself, and hence their work suffers from a certain lack of concentration.

In this latter respect the reports of the botanist, chemist, and assistant chemist contrast favorably with those just spoken of; in part, doubtless, on account of the nature of the work undertaken. The paper on 'Viscometry,' by the chemist, deserves more than a passing notice. By means of a simple and inexpensive apparatus he is able to determine with great accuracy the relative viscosity of liquids, and to show that it varies greatly as between different liquids, and may be made a very delicate means for detecting adulterations in certain cases. The method has thus far been applied chiefly to dairy products, and with very satisfactory results, although the investigations are not yet completed.

The New York report, as a whole, contains the records of a vast amount of labor; but in many cases it is only a record, and nothing more. While this is necessarily the case with large portions of the work, there are other portions whose value is practically lost for lack of a careful discussion of the results, and the value of the whole to the ordinary reader would be greatly enhanced by a more free employment of the resources of typography to indicate the divisions and subdivisions of the subjects considered.

CHALLENGER REPORTS.

THE present volume is devoted to the Crustacea (Isopoda, part ii., and Brachyura) and Polyzoa (part ii.).

In his first report on the isopods, Mr. Beddard dealt exclusively with the Serolidæ; and the

Report of the scientific results of the exploring voyage of the Challenger. Zoölogy, vol. xvii. London, Government. 4°.

present part takes up the other families, and completes the description of this group. He has omitted detailed descriptions of species obtained by the Challenger but already known to science, except where needed for comparison with new forms; but when from a new locality or habitat, the fact has been recorded.

The Challenger collection is very rich in new species, especially among the deep-water forms, of which no less than thirty-eight are new to science. Among the shallow-water forms the greater number of novelties were from the neighborhood of Kerguelen and Australia. The benthic region is very irregular in its isopod fauna, if the dredgings of the Challenger afford a criterion. Over the central and southern Atlantic and central and western Pacific no species at all were found; but where any occurred, they seemed to comprise a considerable variety of forms. Thirty-four of the abyssal isopods are totally blind, three appear to have degenerate eyes, while eighteen have well-developed eyes. But of the eleven genera exclusively resident in the deep water, only two have eyes; of those remaining, seven belong to genera which in shallow water always have eyes; while the remaining eighteen species belong to genera which are blind whether in deep water or not. The differences are not easily explained. That some species should retain and others lose their eyes under apparently similar conditions, it is difficult to account for. Mr. Beddard suggests that those retaining eyes are probably the later emigrants to the abysses from the shallows.

The deep-sea isopods are remarkable for the development of spines on the body, especially in the *Arcturi*, and often attain extraordinary size; one, *Bathynomus giganteus*, reaching a length of nine inches. In these tendencies the abyssal species resemble those of the polar seas, where the temperature conditions are not dissimilar.

The report on the *Brachyura*, by Edward J. Miers,* is devoted to a systematic account of the numerous species collected, with revision of the classification, and lists, as complete as possible, of the recent species of each genus not included in recent and accessible monographs. The genera have been re-diagnosed on a uniform plan, thus furnishing a most useful supplement to these monographs, and preparing the way for a catalogue of the *Brachyura*, — a work much needed by students of the higher Crustacea. The author regrets that ill health has prevented him from adding a bibliography and other useful details, and even from personally revising the proofs, and in general attaining the high standard of perfection which he aimed at, though doubtless such faults or deficiencies are much more apparent to him

than to those who will gratefully appreciate and use the results of his arduous studies.

The abyssal region of the ocean affords no *Brachyura* at all, but few occur in depths of over five hundred fathoms. The great mass of the collection is from shallow waters, and its novelties chiefly from the less-explored coasts and islands of the Indo-Pacific region. There were but two species, both belonging to the genus *Ethusa*, taken in over one thousand fathoms: one of these, *E. Challengeri* Miers from 1875, is from the greatest depth recorded for any true crab.

The report on the *Polyzoa Cyclostomata*, *Ctenostomata* and *Pedicellinea*, by George Busk, possesses a melancholy interest as the last production of that veteran and indefatigable naturalist. The revision of the proofs was performed by him only a few weeks before his death.

Forty-six species were collected by the Challenger, of which thirteen are regarded as new. Of the thirty-three cyclostomate forms, thirteen had previously been known in a fossil state. This group alone reaches deep water; and of the species, only two were obtained from more than one thousand fathoms, and none from over fifteen hundred fathoms. One of the above dredged in sixteen hundred fathoms is also known from various depths up to fifty fathoms. None of the forms described appear to be particularly remarkable.

DR. CHAPMAN, in the *Medical and surgical reporter*, says that nine-tenths of wild animals in confinement are subject to heart-disease, although all animals have their peculiarities. The elephants are heirs to many diseases, but the most common and fatal is rheumatism. Monkeys and baboons generally die from bronchial affections and heart-disease; felines, such as lions, tigers, leopards, etc., from dysentery and heart-disease; deer, antelopes, etc., suffer most from dysentery and heart-disease; while the canine tribe, such as wolves, dingoes, and foxes don't seem to be subject to any disease except 'pure cussedness.' The only thing to be feared in the wolf tribe is too much sociability. It is unsafe to keep more than a pair together; otherwise they would eat each other.

— Under a law which has just passed the Minnesota legislature, the restrictions placed upon the practice of medicine in that state will be more severe than in any other part of the United States. All persons who wish to practise medicine after July 1 must pass an examination before a board of nine persons, irrespective of whether they hold regular diplomas or not, and only those who have taken three courses of medical lectures will be permitted to the examination.